

APPLICATION OF GEOGRAPHIC INFORMATION SYSTEMS (GIS) TO IDENTIFY ECOTOURISM POTENTIAL SITES OF SONGKHLA LAKE BASIN, THAILAND

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ABSTRACT: Songkhla Lake Basin (SLB) situated in the southern part of Thailand, has high ecotourism potential due to the basin's abundant natural and cultural resources. Ecotourism might be an appropriate concept for the sustainable tourism development on this area which can play balanced role between the demand of lake tourism and fragile condition of Lake Ecosystem. The main objective of this study is to identify the potential ecotourism sites of SLB by using Geographic Information Systems (GIS) as a decision supporting tool for sustainable development of Lake Basin. This study leads to improve socio-cultural, economic and environmental development of SLB.

Spatial and non-spatial data associated with the socio-cultural and natural resources were spatially analyzed. Forest, water resources, biodiversity and carrying capacities were highly correlated among 15 factors.

Analyses were carried out in this study to assess potentials as well as the risk of ecotourism resources in SLB. Finally, the results were classified according to level of ecotourism potentials as high, moderate or low for sustainable development of SLB. On the basis of these criteria, Khao Pu-khao Ya National Park, Namkhag National Park, Thale Noi etc. were found as high potential areas; Pha Dam Forest, Oak Thalu Hill, Manorah Waterfall etc. were found as medium potential areas and Ta-Chiad Irrigation reservoir, Pa Prem Park etc. were found as low potential areas.

BACKGROUND

Thailand's glorious traditions and rich cultural values are very much linked with the development of tourism. From last decades, the tourism industries of Thailand have been tremendously progressing and playing a major role in the economic development of the country. However, this rapid growth of tourism has negative impact on environment as well as social sector. Realizing this fact, there is a need of protecting fragile environment for the future generation making it more lucrative for the present generation. For this, the concept of sustainability arises to harness the potential available tourism resources (Kontogergopoulos, 1998).

Ecotourism is the concept or strategy to meet the principle of sustainable development. Ecotourism is responsible travel to natural areas that conserves the environment and improves the welfare of the local people (Fennel, 1999). The importance of ecotourism as a strategy for sustainable development was recognized during the Earth Summit in 1992, when sustainable tourism was considered as an environment-friendly economic activity. The fundamental function of the ecotourism is the protection of the natural and cultural resources, income generation, education, local participation and capacity building (Ross & Wall, 1999). Being a nature based tourism; it takes into account the natural ecological attractions, their conservation and development. Its main aim is to safeguard the environment, provide benefit to the local people by generating revenue and education and pleasure for the tourist (Wearing, 1995).

Ecotourism is one of the fastest growing tourism industries of developing countries and it is very much related to natural and protected areas. Over the last twenty years, ecotourism has become both an important sector of the tourism market and an increasingly important set of principles and practices for socially and environmentally that is serving as a catalyst to reform the entire tourism industry (Boyd & Butler, 1996). The development of tourism in and around protected areas is seen as one of the best ways of delivering economic benefits to remote areas by providing local employment, stimulating local markets, and improving transportation and communication infrastructure (Rose & Wall, 1999). These are vitally important for a developing country like Thailand. The contribution of ecotourism is not only to protect valuable natural resources of the environment but also to benefit the local population and national economy (Kontogeorgopolos, 2005).

Songkhla Lake is the natural and largest lake in Thailand and located in the southern part of the country and its basin covers an area of approximately 1,042 km² consisting of four interconnected lake ecosystems. It has been playing an important role on physical, economical and spiritual development of people of this region. Due to the basin's abundant natural and cultural resources, the potentiality of ecotourism in SLB is high (Natural Resources and Environmental Policy and Planning [NREPP], 2005).

Even though SLB is one of the major ecotourism potential sites of Thailand, it has been facing many environmental problems. If these problems are not solved promptly, they will create many obstacles for the development of SLB. Ecotourism is expected to contribute in both conservation and development of environment. It has also additional appeal of promoting environmental responsibility and education by enabling tourists to enjoy the beauties of sensitive areas and provide opportunities in preservation activities. Ecotourism is also one of the appropriate ways to achieve sustainable development. To achieve sustainable development through ecotourism, identification of the potentiality of ecotourism sites of SLB is the major task. It is very essential to identify and classify the sites of SLB for proper development of ecotourism. So, the main objective of this study is to identify the potentiality of ecotourism sites of SLB by using GIS as decision supporting tool for sustainable development of Lake Basin. From this study, potentiality of ecotourism sites were categorized into high potential area, moderate potential area and low potential area on the basis of environmental, economical and social indicators.

MATERIALS AND METHODS

Identifying potential sites of ecotourism is a complex process, involving not only technical requirement but also physical, economical, social, environmental and political requirements that may result in conflicting objectives. These complexities necessitate the simultaneous use of several decision support tools. In this study, Remote Sensing (RS), GIS and Multi Criteria Decision Making (MCDM) were used to identify the potential ecotourism sites based on the environmental, economical and social indicators (Armstrong, 1994).

Study Area

SLB is situated in the southern part of Thailand and covers an area of 1080 sq. km lake and is surrounded by 8640 sq. km. basin. SLB lies on three provinces, i.e., all 11 districts of Phattalung Province, 12 (out of 16) districts of Songkhla Province and 2 (out of 23) districts of Nakhori Si Thammarat Province. The lake system can be divided in four interconnected ecosystems: Thale Noi in the northernmost part, a fresh water system, Thale Luang (Upper Songkhla) in the upper lake, also a freshwater system, Thale Sap (Middle Songkhla) in the middle of lake, a brackish water system, and Thale Sap (Lower Songkhla) in the southernmost part, a sea water system (NREPP, 2005).

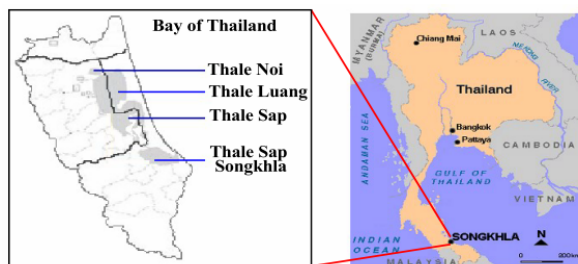


Figure 1: Songkhla Lake Basin

Finding Potential Area

To find the potential area for ecotourism requires consideration of a comprehensive set of factors and balance of multiple objectives in determining the suitability of a particular area (Wearing, 1995).

Selection Tools

GIS and Multi-criteria Decision Making (MCDM) techniques have been used in this study. The Analytical Hierarchy Process (AHP) has been used to understand complex problem and solve the problem in a hierarchical structure and pairwise comparison has been used to determine the trade-offs among objectives (Esalami & Roshani, 2009).

Data

Ecotourism has high correlation with sustainable tourism and environmental, social, economical and cultural aspects are the important factors of sustainable tourism (Fennel, 1999). In this study, biodiversity of location, density of forest, environmental resilience etc. were used on constructing environmental development index. Numbers of tourists, amount of money spent,

social carrying capacity, diversity of tourists were used in constructing economical development index. Satisfaction of tourist and host community, health and safety were used for constructing social development index. Cultural diversity, access to water, road and public participation were also used as criteria for evaluating potential sites. The information of roads, district boundary, and the religious sites were collected from the district office. Demography data were obtained from the provincial office and the data of the domestic and international tourists were collected from the Tourism Authority of Thailand (TAT). The information about forest, biodiversity, flora and fauna etc. were collected from the department of forestry. Socio- economic features of the basin were collected with the help of questionnaire and group discussion. On the basis of these information, the layers of environmental development index (EnDI), social development index (SDI), economical development index (EDI), cultural diversity (CD), road access (RA), water accessibility (WA) and local participation (LP) were constructed.

Weighing

Weighing scores for each criterion was derived from analytic hierarchy process (AHP) by directly comparing importance of one criterion to another. Rules for defining the score are: the score is equal to “1” when criteria in columns are less significant than those in row, the score is “2” when criteria in columns are equally significant as those in row, and the score is “3” when criteria in columns are more significant than those in row. When criteria in columns are same as those in row, the score are equal to “0”.

Table 1: Calculated weights by using seven indicators.

Indicators	Weights
EDI	W1= 0.22
SDI	W2= 0.19
EnDI	W3= 0.17
CD	W4= 0.14
LP	W5= 0.13
WA	W6=0.08
RA	W7=0.07

Ecotourism Potentiality

Each input criterion was assigned with its weight, and then the sum of seven criteria with their weight gave the result of ecotourism potential index (EPI) as given below

$$EPI= w1 \times EDI + w2 \times SDI + w3 \times EnDI + w4 \times CD + w5 \times LP + w6 \times WA + w7 \times RA$$

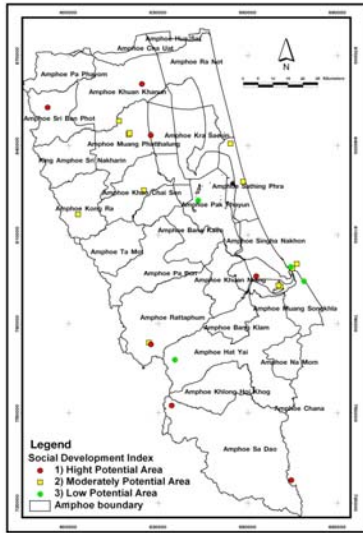


Figure 2: SDI

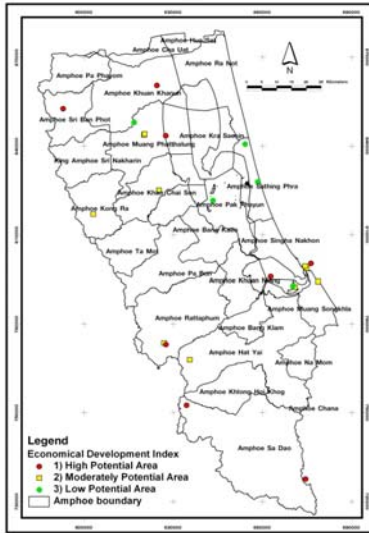


Figure 3: EDI

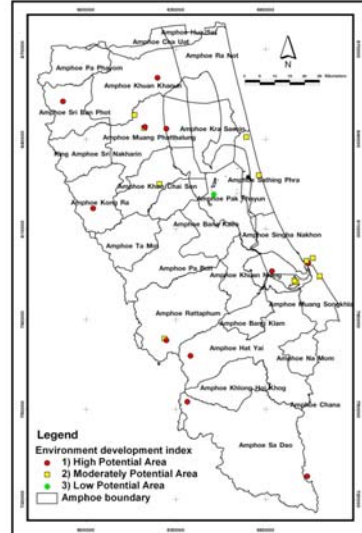


Figure 4: EnDI

RESULTS AND DISCUSSION

By using the concept of AHP and pair-wise comparison method and, assigning different weight for different layers, the potentiality of ecotourism was categorized into three board types: 1) high potential area 2) moderate potential area 3) low potential area. There were 40% high potential area, 48% moderate potential area and 12% low potential area in the Songkhla Lake Basin. The mean and standard deviation of EDI was 64.80 ± 18.23 , SDI was 70.80 ± 13.82 , EnDI was 63.60 ± 14.96 , CD was 59.60 ± 14.85 , the value of LP was 60.4 ± 13.1 , and WA was 59.6 ± 14.85 . From correlation analysis, there existed a positive correlation between economical development index with social and environmental development index ($p < 0.05$).

Analyzing the map of economical development index, 9 sites were identified as high potential areas, 11 sites as moderate potential areas and 5 sites as low potential areas. Analyzing the map of social development index, 8 sites were identified as high potential area, 13 sites as moderate potential areas and 4 sites as low potential areas. Analyzing the map of environmental development index 10 sites were identified as high potential areas, 13 sites as moderate potential areas and 2 sites as low potential areas. Considering all seven criteria, 10 sites were identified as high potential area: Khao Pu-khao Ya National Park, Namkhag National Park, Thale Noi Non hunting area, Thale Sab Non-hunting area, Ko yai etc.; 12 sites as moderate potential areas: Pha Dam Forest, Oak Thalu Hill, Manoraha Waterfall, Laem Po, Ko Mak etc.; and 3 sites as low potential areas: Ta-Chiad Irrigation reservoir, Pa Prem Park and Ko Nu & Ko Maeo.

The study shows that the western and lake area of the basin are highly potential for ecotourism development, most of these parts are endowed with lush green forests, wildlife as well as rich cultural heritage. So this area can be developed as ecotourism destination by facilitating proper ecotourism infrastructure and services under policy guidelines. This will help conserve and maintain the biological richness of the areas as well as economic upliftment of the local people by providing employment and opportunities in the field of ecotourism management.

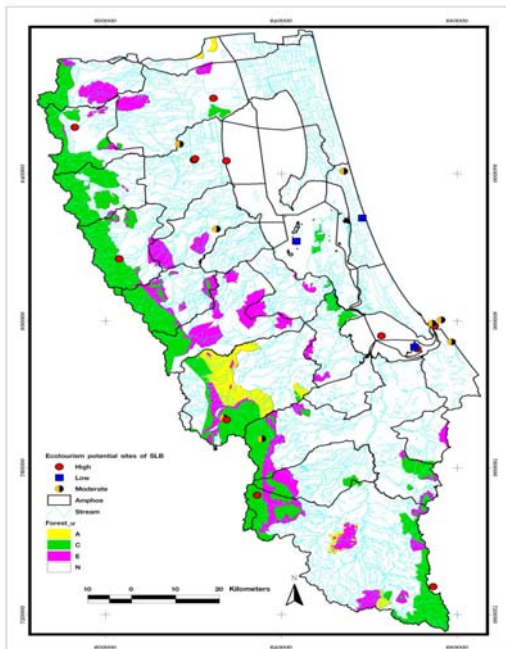


Figure 4: Ecotourism Potential Index (EPI)

CONCLUSION

The demand of nature based tourism is in the rising trend and increased human interference in the ecologically fragile areas can cause irreversible changes in the existing ecological processes. Ecotourism might be the best way to handle and solve this problem and it is also one of the formats of achieving sustainable development. The present study tries to develop an integrated approach of ecotourism development by identification of ecotourism sites.

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